Divide Multi-Digit Numbers

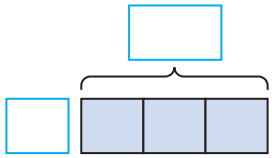
Use What You Know

In 5th grade, you learned how to divide using models and partial quotients. Take a look at this problem.

For a fundraiser, the sixth graders have 288 bags of popcorn to sell. There are 3 sixth-grade classes. If each class sells an equal number of bags, how many bags of popcorn does each class sell?

Use the math you already know to solve the problem.

a. Use a bar model to represent the problem. Fill in the whole and the number of groups.



b. What division expression represents this problem? _____

c. Estimate the quotient. The quotient is around _____. Explain your thinking.

_____

d. Use your estimate. At least how many bags of popcorn should each class sell? _____

e. How many bags are left to sell altogether? _____ By each class? _____

f. How many more bags can each class sell? How do you know? _____

_____

g. Explain how to find the total number of bags of popcorn each class can sell.

_____

_____

_____

Find Out More

You used partial quotients to solve the problem.

```
          96  <-- quotient
           6  } partial quotients
          90  }
divisor --> 3)288  <-- dividend
        − 270  <-- 90 × 3
           18
         − 18  <-- 6 × 3
            0
```

You know that 90 groups of 3 is 270.
Subtract to find how many are left.
288 − 270 = 18

You know 6 equal groups of 3 is 18.
Subtract to find how many are left. 18 − 18 = 0

To find the quotient, add the partial quotients.
90 + 6 = 96. So, 288 ÷ 3 = 96.

You can also use the division algorithm to find the quotient.
This method is like partial quotients, except you need to pay attention to place value.

You know the quotient is around 90.

```
   H T O
     96
  3)288
  − 270  <-- 27 tens or 270 ones
     18  <-- 18 ones
   − 18
      0
```

288 is 28 tens and 8 ones.
There are 9 groups of 3 in 28.
9 tens × 3 ones = 27 tens.
28 tens − 27 tens = 1 ten

27 tens is the same as 270 ones.
When you bring down the 8 ones to get 18,
you are subtracting 270 from 288.

There are 6 groups of 3 in 18.
6 ones × 3 = 18 ones.
18 ones − 18 ones = 0. There is no remainder.

So, 288 ÷ 3 = 96.

Reflect

1 To divide 343 by 9, would you use partial quotients or the division algorithm? Explain your reasoning. ______________________________

____

____

____

Learn About Using the Division Algorithm

Read the problem below. Then explore how to divide with a two-digit divisor using partial quotients or the division algorithm.

A family is heading out on a car trip of 672 miles to what is known as the sixth most popular National Park, the Blue Ridge Parkway. If they travel at an average of 56 miles per hour, how long will it take to get there?

Estimate it You can use compatible numbers to estimate the quotient.

$660 \div 60 = 11$

Model It You can use partial quotients to divide.

$$
\begin{array}{rl}
12 & \leftarrow \text{quotient} \\
\mathbf{2} & \rbrace\ \text{partial quotients} \\
\mathbf{10} & \\
\text{divisor} \rightarrow 56\overline{)672} & \leftarrow \text{dividend} \\
-\ 560 & \leftarrow 10 \times 56 \\
112 & \\
-\ 112 & \leftarrow 2 \times 56 \\
0 &
\end{array}
$$

Model It You can use the division algorithm to divide.

$$
\begin{array}{rl}
\text{H T O} & \\
12 & \\
56\overline{)672} & \\
-\ 56\downarrow & \leftarrow 56 \text{ tens} \\
112 & \leftarrow 112 \text{ ones} \\
-\ 112 & \\
0 &
\end{array}
$$

672 is 67 tens and 2 ones.
There is 1 group of 56 in 67.
1 ten × 56 = 56 tens
67 tens − 56 tens = 11 tens

Bring down the 2.

There are 2 groups of 56 in 112.
2 ones × 56 = 112 ones
112 ones − 112 ones = 0 ones

Connect It Now compare the two methods of dividing to solve the problem.

2 Why does it make sense to use 660 and 60 to estimate the quotient?

3 How is writing the 1 in the division algorithm the same as writing the 10 in the partial quotients model?

4 How is writing the 56 in the division algorithm the same as writing the 560 in the partial quotients model?

5 When solving this problem with the division algorithm, how is bringing down the 2 ones like the first subtraction step in the partial quotients method?

6 How long will it take the family to drive to the park? _____ How can you check your answer?

7 How is using the division algorithm to divide the same as using partial quotients to divide? How is it different?

Try It Use what you just learned about dividing to solve these problems. Show your work on a separate sheet of paper.

8 A grandmother has $490 that she wants to give to her 14 grandchildren. How much money will each grandchild receive if they each receive an equal amount? _____

9 18 students each collected the same number of cans for a project. If the students collected a total of 306 cans, how many cans did each student collect? _____

Learn About Dividing with 5-Digit Dividends

Read the problem below. Then explore how to divide a 5-digit dividend by a 2-digit divisor.

Sam's father bought a new car for $26,304. He expects to pay for it in 24 equal monthly payments. How much will Sam's father have to pay each month?

Estimate it

You can use compatible numbers to estimate the solution.

$\$24{,}000 \div 24 = \$1{,}000$

Model It

You can use the division algorithm to solve the problem.

```
ThHTO
 1096
24)26,304
 − 24
   23
  − 0
   230
  −216
    144
   −144
      0
```

26,304 is 26 thousands, 3 hundreds, and 4 ones.

There is 1 group of 24 in 26.
1 thousand × 24 = 24 thousands
26 thousands − 24 thousands = 2 thousands
Bring down the 3.

There are no groups of 24 in 23.
0 hundreds × 24 = 0 hundreds
23 hundreds − 0 hundreds = 23 hundreds
Bring down the 0.

There are 9 groups of 24 in 230.
9 tens × 24 = 216 tens
230 tens − 216 tens = 14 tens
Bring down the 4.

There are 6 groups of 24 in 144.
6 ones × 24 = 144 ones
144 ones − 144 ones = 0 ones
There is no remainder.

Connect It Now answer the question and think about the division algorithm.

10 How much will Sam's father have to pay each month? _____ Is that answer reasonable? Explain. _____

_____

11 Look back at the division algorithm. What is 24 × $1,096? _____

12 Suppose Sam's father decides to pay for the car in 48 equal monthly payments. How much would he have to pay each month? _____

Show your work.

13 Why is it important to pay close attention to place value when dividing with the division algorithm? _____

_____

Try It Use what you just learned to solve these problems. Show your work on a separate sheet of paper.

14 In a year (12 months), a sports team practiced for a total of 1,305 hours. On average, how many hours did the team practice each month? _____

_____

15 There are 1,891 students participating in the citywide holiday concert. A bus seats 62 students. How many buses will be needed to bring the students to the concert?

_____

_____

Practice Dividing Multi-Digit Numbers

Study the example below. Then solve problems 16–18.

Example

The marching band packed 3,060 cans of juice into boxes for a band competition. Each box holds 18 cans. How many boxes did the band members have to carry?

Look at how you could show your work using the division algorithm.

$$\begin{array}{r} 170 \\ 18\overline{)3{,}060} \\ -\ 18 \\ \hline 126 \\ -\ 126 \\ \hline 0 \end{array}$$

Solution 170 boxes

The student remembered to write a 0 in the ones place in the quotient to show that there were no ones left.

Pair/Share
How could you check your answer?

16 A local bank donated 4,074 pencils to distribute equally among the 42 sixth-grade classes in the district. How many pencils did each class receive?

Show your work.

What is a good estimate for the quotient?

Pair/Share
Does your answer make sense?

Solution _____

17 At an amusement park, only 18 people are allowed on a ride at the same time. There are 157 people waiting in line. How many groups of riders will there be?

Show your work.

If there is a remainder, I need to decide whether to round up or down.

Solution _____

Pair/Share
Compare the steps you each took to solve this problem.

18 Route 80 runs a little over 2,900 miles across the United States from the New York City area to San Francisco. If you drove the entire length in 14 days, on average how many miles would you travel per day? Circle the correct answer.

A a little more than 27 miles per day

B a little more than 2,070 miles per day

C a little more than 207 miles per day

D a little more than $\frac{27}{10}$ miles per day

What is the whole in this problem?

Cody chose **A** as the correct answer. How did he get that answer?

_____

_____

_____

_____

Pair/Share
Talk about the problem and explain how you could get each of the answers.

Practice Dividing Multi-Digit Numbers

Solve the problems.

1 Charlotte read a 608-page book in 16 hours last month. How many pages per hour was that?

A 38 pages

B 380 pages

C $4\frac{2}{16}$ pages

D 3 r4 pages

2 There are 3,072 books in the school library. If 96 students team up to read all the books and each student reads the same number of books, how many books would each student need to read?

A about 4 books

B 32 books

C $30\frac{72}{100}$ books

D about 307 books

3 A farmer needs to pack 2,903 apples into crates to ship to supermarkets. Each crate can hold only 30 apples. Choose *True* or *False* for each statement.

a. The farmer can ship all the apples using 96 crates.	☐ True	☐ False
b. The farmer can ship all the apples using 97 crates.	☐ True	☐ False
c. At least one of the crates will not be filled to capacity.	☐ True	☐ False
d. To determine the number of crates needed, divide 2,903 by 30.	☐ True	☐ False

4 In each box, write the appropriate digit to complete the division algorithm.

```
            9 □
       ________
256 ) 2 □ 8 3 5
    − 2 3 0 4
    ---------
        1 7 9 □
      − 1 7 9 2
      ---------
              □
```

5 An elementary school received a donation of $1,000. The school has 4 kindergarten classes and 3 classes each in Grades 1 through 6. Can the money be divided equally among the classes? Explain.

Show your work.

Answer _____

_____

6 The seating capacity of a basketball stadium is 5,782. The seats are arranged in 24 sections of the same size. Any seats that are left over from the 24 sections are called "priority seating." How many seats are called "priority seating"?

Show your work.

Answer _____

Self Check **Go back and see what you can check off on the Self Check on page 51.**